Responsible Land Governance:
Towards an Evidence Based Approach
ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017

G-GOVERNNACE IN SUPPORT OF GLOBAL AGENDA
GOOD PRACTICES FROM SERBIA

RUMYANA TONCHOVSKA, BORKO DRASKOVIC, JELENA MATIC-VARENICA, DARKO VUCETIC

Rumyana Tonchovska, FAO of the UN
Rumyana.Tonchovska@fao.org
Borko Draskovic, RGA, Republic of Serbia
office@rgz.gov.rs
Jelena Matic-Varenica, RGA, Republic of Serbia
jmatic-varenica@rgz.gov.rs
Darko Vucetic, RGA, Republic of Serbia
darko.vucetic@rgz.gov.rs

Paper prepared for presentation at the
"2017 WORLD BANK CONFERENCE ON LAND AND POVERTY"
The World Bank - Washington DC, March 20-24, 2017

I. INTRODUCTION

We live in a world of tremendous changes: unpredictable climate change, enormous demand for land and other natural resources, huge migrations of people to new megacities, millions of migrants have made their way across the Mediterranean to Europe, and all this in a world where the population is still growing. 7 billion people now live in our planet!

In response to these challenges, on September 27, 2015 the UN's 193 Member States have adopted new global goals for the next 15 years at the UN Sustainable Development Summit in New York. "Transforming our World: The 2030 Agenda for Sustainable Development" (17 Sustainable Development Goals and 169 targets). Monitoring the progress will become obligatory for all countries.

Action on climate change is essential to meeting development aims. At the Paris summit in December 2015, 196 countries negotiated new climate change agreement. Climate change is expected to lead to reductions in agricultural productivity, and threatens the availability of natural resources, livelihoods and food security of small farmers and the rural poor.

Many of these challenges have a clear land dimension: unequal access to land; insecurity of tenure; unsustainable land use; and weak institutions for land administration, etc. Responding to these challenges is particularly difficult when the governance of land is weak.

The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT) (www.fao.org/nr/tenure/en) can serve as a tool to inform countries on tenure policy and legal frameworks that are developing their strategies to prevent and respond to climate. Part 6 of the VGGT Responses to climate change and emergencies (pp. 35-38) specifically addresses Climate change in section 23 and Natural disasters in section 24.

Improved use of spatial data is a key element of strategies for addressing these challenges. Investments in geospatial technologies can address various activities, including sustainability programs around land, water, food, natural resources as well as other aspects including National Security, Disaster Response and Resiliency, Infrastructure development, and Utilities. This investment can help governments ensure the sustainable development of the country's economy. E-governance in spatial data management (Geospatial Governance or gGovernance) is an area of rapid innovation in developed economies, and emerging economies can leap-frog ahead in this area. It is the cornerstone of thriving economies around the globe and is now being adopted by emerging economies as well. gGovernance leverages the latest advances in geospatial technologies to map and monitor the resources of an entire nation, allowing for the quantitative documentation of policy implementations on the ground.

Spatial Data Infrastructure (SDI) is potentially game-changing for development as it allows governments to integrate planning, taxation, disaster risk management and climate change monitoring, mitigation and adaptation in new ways with great savings in time and funds, while improving overall service and governance.

Remote sensing and geospatial technologies have reached the critical mass to start addressing, establishing and improving land governance. These technologies coupled with advances in cloud

computing, high performance computing, mobile technologies, GPS, and others can provide innovative ways to addressing land governance including creating and maintaining land register systems. The technologies can address land governance issues for urban as well as rural areas, agriculture as well as pasture and forested lands. With maps covering entire countries and the ability to refresh the areas on a periodic basis, geospatial information provide new and innovative ways to address land governance issues and provide fast and economical alternatives to current methodologies.

Integrating earth observation geospatial information and statistical data is key for measuring the progress towards achieving the SDGs. The role of statistical and mapping authorities in monitoring progress toward achieving SDGs is expected to increase and we have to be ready to play that important role to help our governments to make better decisions and make better investments when and where needed.

FAO is supporting the Serbian Republic Geodetic Authority (RGA) to establish a Centre of Excellence for collecting best practices, share knowledge and experience within the country and across Western Balkans countries to pilot innovative ideas, making best use of the available technologies and data sets for evidence base policy making in several priority areas for both the Government of Serbia and for the FAO and promote those best practices to other regions around the globe.

Republic Geodetic Authority (RGA) is a state institution, which was entrusted with the official records of real estate and real estate rights holders, as well as with the obligation to provide reliable and up to date geospatial data and property rights information and to provides its services qualitatively, transparently and effectively, permanently aligning its work with international standards, contemporary technological solutions and customer needs. Under its jurisdiction are the establishment and maintenance of Geodetic Reference Systems, Real Estate Cadastre, Utility Cadastre, Register of Administrative Units, Address Register and Register of Geographical Names as well as activities on State survey, Topographic Mapping and Real Estate Valuation. Republic Geodetic Authority is a national Spatial Data Infrastructure coordinator and INSPIRE National Contact Point. It has an experienced team in using geospatial data and services in support of various government institutions in Serbia to make best use of available data and technologies.

The World Bank and FAO are creating a Global SDI Diagnostic Tool, which has been tested in several countries, including in Republic Serbia and the methodology used and the pilot results will be presented in a separate paper “Creating Spatial Data Infrastructure Diagnostic Tool” during the Bank conference.

This paper presents the contribution of SDI, geospatial data and services to improve land governance and achieve the Global Agenda, covering the stage of implementation of Serbian SDI, the Serbian RGA Road Map to establish a Center of Excellence to support government and municipal authorities form Serbia and the region to make best use of available, infrastructure, data and services and practical cases from Serbia with the use of geospatial data and services.

II. SPATIAL DATA INFRASTRUCTURE IN SERBIA

The Republic Geodetic Authority of Republic of Serbia (RGA) is the national contact point for the NSDI implementation and is responsible for establishment, maintains and management the NSDI national geoportal, monitors and reports on the INSPIRE Directive implementation, maintains the registers of stakeholders and monitors the spatial data infrastructure development at all levels. In 2009 the law on State Survey and cadastre [legal basis for NSDI establishment] has been adopted and the initial national Geoportal [www.geosrbija.rs] put in operation. In 2010-11 NSDI Bodies [NSDI Council + NSDI working groups: cooperation, legal and technical framework] have been established and Metadata [Profile + Editor] implemented. Serbia is reporting on the implementation of NSDI since 2012 - State of play form [Survey and analysis of status within geo-sector]. In 2017, Republic Geodetic Authority adopted the RGA Strategy 2020. The strategy envisages development of a Roadmap for the use of geospatial data and services.

RGA plans to establish a Regional Center of Excellence for Geospatial Information Management, which would improve the use of the available data and services. Such Center would also accelerate the European integrations of the entire region, improve the cooperation between the institutions and the countries in the region and enable the region to keep up with technological innovations and experiences world-wide. The basic function of the Center would be to develop, find and share the most optimal solutions for the geospatial data management within the spatial data infrastructure through innovation, developing methodologies and training.

Republic of Serbia is one of the first countries around the world, where the Global SDI Diagnostic Tool, developed by the World Bank and FAO was tested. The methodology used and the summary of the test results from several countries are presented in a separate paper "Creating Spatial Data Infrastructure Diagnostic Tool". This diagnostic tool has shown the strengths in NSDI implementation in Serbia, but also provided recommendations for the areas that still require more work, and which can be targeted in the near future in order to maximize the possibility of achieving the full benefits of NSDI. The summary of the strengths and weaknesses of the NSDI implementation in Serbia, coming out of the Global Diagnostic Tool and Scorecard, are:

Strengths: Serbia has made significant progress in establishing NSDI leadership and strong governance mechanism, regular reporting on the progress to the EU and to the Government, preparing a legal base in line with the EU INSPIRE Directive, linking NSDI with the Open Data policy and e-government strategy, sustainability of NSDI ensured, operational geoportal, several organizations providing access to their datasets via NSDI, including municipal level, various good examples of NSDI use in Serbia already exist, metadata standards in line with INSPIRE Technical Specifications are in use, all core datasets are available via NSDI Geoportal, strong team at the RGA with sufficient capacity to support the NSDI implementation.

Weaknesses: Capacity development at all levels are needed and RGA takes steps in that direction with the plans to establish a regional center of excellence for management of geospatial information; engagement/communication strategy is missing; linking NSDI with the SDGs should be planed; strengthening the work with the Universities and Research and Development institutions to motivate development of innovative solutions for creating new applications would increase the benefits of the NSDI; quite a lot of work remains to harmonise the data with INSPIRE

Data Technical Specifications; NSDI socio-economic benefits are not fully recognized, discussed and quantified.

The next sections describe the status of the NSDI implementation in Serbia and present good practices for the NSDI use and the future plans.

III. POLICY & STRATEGY

The Strategy for establishment of SDI in the Republic of Serbia for the period 2010 to 2012 has been adopted by the Government on 28th October 2010. The aim of the strategy is the establishment of NSDI in accordance with the requirements of the INSPIRE directive. It defined the guidelines and the key activities that lead to the creation of Serbian infrastructure for exchange of high quality spatial data sets and services based on cooperation among SDI stakeholders for use by the public sector, business and the public in general. Also, the Strategy provided an important contribution to the development of e-government and stipulated, as one of the specific objectives, development of the National Geoportal based on the initial geoportal as a national "node" for cooperation and exchange of geo-data in accordance with the INSPIRE.

Government of Republic Serbia adopted Ordinance on determining the medium-term program of work on establishing and maintaining NSDI for the period 2011 to 2015. By the mid-term program were determined type and scope of activities, the time frame for performance of activities, sources of funding and volume of the funds required for their implementation, as well as parties responsible for its implementation.

Generally, policy for data sharing in Serbia is heterogeneous at the moment and depends on high-level political climate. RGA is the leading institution in Serbia when it comes to provision of key geo information. The exchange and distribution of geospatial data is performed in accordance with regulations. Basic provisions for use of data and services within the jurisdiction of RGA are regulated by the Law on State Survey and Cadaster and the By-law on amount of fees for RGA services.

Under the Real Estate Management Project (2015 – 2020) supported by the World Bank, RGA planned activities related to the NSDI establishment aiming to develop business model and technical framework in line with standards for geo information. Business model for NSDI should include formulation of funding model, pricing policy, spatial data sharing and dissemination, licensing, cost-benefit analysis, and access to spatial data for purpose of disaster risk management. From the RGA perspective, in order to achieve data sharing policy where sustainable model enables data providers maintenance and quality improvements of products and services based on spatial data in line with the INSPIRE, it is essential establishment of balance between public interest for easy access to data under favorable conditions and, on the other hand, sustainable environment for production and update of geo information. Development of NSDI technical framework encompass establishment of network services and application of the INSPIRE implementing rules aiming to reach interoperability by harmonization of spatial data themes under jurisdiction of RGA.

Government of the Republic of Serbia adopted at the beginning of 2017 Strategy of Measures and Activities for Increasing of Quality of Services in the Field of Geospatial Data and Registration of Property Rights in Official State Register – Reform Path of Republic Geodetic Authority by 2020 (hereafter: RGA Strategy 2020). The overall objective of the RGA Strategy 2020 is to support the economic reform program of the Government by providing up to date geospatial data and information on the real estate market to all ministries, government institutions, and individuals for faster and easier decision-making be it on investment planning, construction of residential, commercial or infrastructure facilities, environmental protection, assistance in case of natural cadastre and the like. One important goal is to improve access to geospatial information and simplify and speed up communication between government and citizens through the eGovernment portal. As a first step to achive effective implementation of planned activities within RGA Strategy 2020, it is necessary adoption of the law on the NSDI. NSDI Strategy 2017-2021 as well as NSDI Business model were planned to be adopted by the end of 2017.

Open Data

The first analyze of openness of governmental data in Serbia was taken by collaboration of the World Bank, UNDP and Directorate for E-Government (Ministry of Public Administration and Local Self-Government) during 2015 by conducting Open Data Readiness Assessment (ODRA) document. The main findings of the ODRA can be summarized as:

- A wide range of government bodies are willing to move forward with open data as a means to increase government effectiveness;
- Strong demand from the business community and civil society to decrease the cost of doing business, and to increase transparency in various policy areas;
- The existing legal framework provides a solid starting point as, although specific concepts such as re-use do not currently exist in the legal sense;
- High level central government awareness of the potential of open data is still week.

Recommendations from the ODRA include the establishing a clear leadership and coordination mechanism for implementing the open data program; introduction of open data into the legislative framework; development of a national open data portal, capacity building of IT capabilities across government in general.

Accordintg to the adopted RGA Strategy 2020, RGA will work actively on the implementation of the principles of open data in the field of spatial data on the state level to help Serbia to improve public services and the availability of spatial data, and thus to accelerate their efficient utilization with a view to supporting the economic development of the Republic of Serbia. To make this concept properly applied, itwas planned to do pre-Feasibility Study, and later the introduction of a detailed plan of open data concept implementation. RGA will carry out this activity in cooperation with international institutions that have extensive experience in the application of this concept. The feasibility study will be made in the first half of 2017, while the implementation plan will be developed in the second half of 2017.

E-government Strategy

The Serbian Electronic Government Development Strategy 2015-2018 underpin the role and impact of open data, as well as in terms of proposing relevant actions and law revisions.

Implementation of the e-government strategy will provide stronger cross-government collaboration that will allow a more successful data access and sharing.

National Disaster Risk Management Program

As a result of heavy rains in May 2014, Serbia was affected by the most devastated flooding in the past 120 years. The flood was trigger to the government to adopt the National Disaster Risk Management Program (NDRMP). The goal of the National Program is building an adequate long-term system of natural disaster risk management in the country, which would entail the cooperation of different institutions working together towards minimizing risks and a more efficient response to natural disasters.

RGA was the only national institution that reacted during floods in 2014 through provision of real time data and its analysis enabling reliable information to the authorities that are assigned to take decisions. RGA is recognized as an important partner in activities related to the Serbia's institutional capacities strengthening, development of procedures and information systems for sharing and disseminating of relevant information without delay planned, through the NDRMP.

Negotiation on accession to European Union

Republic of Serbia started negotiations on accession to European Union on 24 January 2014. RGA is under the European Union Accession negotiating process in charge of reporting on status of the INSPIRE Directive transposition and implementation within the Chapter 27 – Environment and Climate Changes and on implementation of Common Agriculture Policy related to rural development and IACS's LPIS module within the Chapter 11 – Agriculture and Rural Development. Constant support to the accession negotiations with the European Union is envisaged by the RGA Strategy 2020 with the aim to promote sustainable development and preserve the environment for future generations.

IV. GOVERNANCE ARRANGEMENTS

Many governmental agencies are willing to support open data concept. Common general concerns in this aspect are around legal aspects as well practical aspects such as financing, competent staff and capabilities. As well as political and senior leadership, middle management level skills and leadership are important to reach complete utilization of spatial data infrastructure.

There is notable lack of basic knowledge and experience of data and services licensing under the Serbian geo-sector. So far data sharing between public authorities is performed based on ad-hoc non-standardized agreements made for the particular purpose. Development of a national data infrastructure where interoperability for data exchanges between agencies exist is a key aim. This includes wide user identification of governmental and other source data. Problems with retaining of skilled staff and maintaining a sufficient level of IT knowledge across government represent a significant obstacle for a sustainable and integrated role of public service delivery.

V. LEGAL

Establishment of NSDI through implementation of the INSPIRE Directive is mostly driven by the main data providers and users and responsible ministries.

The Law on State Survey and Cadastre, adopted in 2009, provides the legal framework for the establishment of NSDI in Serbia, by transposing some provisions of the INSPIRE Directive. The Law defines basic principles and directions for development of a coordination structure and technical infrastructure: NSDI subjects (stakeholders), establishment, content, metadata, spatial datasets and services, The National Geoportal, constraints, NSDI bodies and competencies of the NSDI Council.

Coordination structure in NSDI implementation is defined by the Law in order to establish bodies and mechanism for communication with contributors on implementation, such as data and services providers, users, researches and education. According to the Law, the NSDI Council and the working groups are established in 2010 and 2011 respectively. The current members of the NSDI Council are representatives from RGA (chairman), Ministry of Construction, Transport and Infrastructure, Ministry of Public Administration and Local Self-Government, Ministry of Defense, Ministry of Mining and Energy, Ministry of Agriculture and Environmental Protection, Ministry of Finance, Statistical Office and Republic Hydro-meteorological Service. Members of working groups are representatives of the ministries and others governmental authorities, local administration, public companies, provincial secretariats, research and education institutions, private companies.

NSDI Council role is steering the creation of institutional and technical framework for establishing common geo information infrastructure on the national level, through formulation of clear guidelines and resources to achieve this goal. The role of the working groups is operational responsibility for thematic issues for specific areas such as: technical infrastructure, standards, metadata and spatial data, cooperation among stakeholders, legal framework, financing models, research, education, etc.

The full transposition of the INSPIRE Directive is planned to be achieved through a new Law on NSDI. The current Law on State Survey and Cadaster didn't fully transferred INSPIRE directive into national law so it is necessary adoption of the law that will determine the rules and efficient way of exchanging data, standardization of data, more efficient way to coordinate the activities of various stakeholders, as well as the method of financing and thereby ensure the sustainability of NSDI.The initial version of the Law on NSDI is drafted as well as discussed on several sessions with stakeholders publically and its adoption is planned in 2017.

Also, By-laws regulating in detail the manner of generation of metadata, rules that ensure interoperability and effective way of sharing and use of spatial data and rules for monitoring the implementation of the INSPIRE directive, are planned to be adopted by the end of 2018.

There are also other laws that directly or indirectly tackle the topic of data processing, hosting, licensing, exchange, sharing and dissemination in Serbia, but also internal regulations of agencies sometimes applies.

The Law on Free Access to Information of Public Importance gives citizens the right to request, in writing, information from public authorities. The Law on Personal Data Protection provides a broad definition of processing of personal data, as any operation undertaken in relation to personal data, including collection, classification, recording, use, copying, transfer, storage, disclosure, dissemination, search, concealment, etc.

The Law on Data Secrecy govern a single system of the classification and protection of secret data which are of interest for the national security and public safety, defense, internal and foreign affairs of the Republic of Serbia; protection of foreign classified data; access to classified data and their declassification; competence of authorities and oversight of the implementation of this Law.

The Law on E-Commerce regulates the conditions and manner of services of the information society, regulation relating to contracts in electronic form, responsibility of service providers of the information society and commercial messages in electronic form. Its area of application is e-commerce of goods and services, which is considered as remote trading. The most important legal mechanism in this Law is application of contracts in electronic form, where is explicitly stipulates that contract can be concluded by electronic means or in electronic form. Implementation of the Law on E-Commerce is supported by the Law on Electronic Document and the Law on Electronic Signature.

The Law on Copyright and Related Rights besides other regulates rights related to the copyright, the way of exercising the copyright and related rights and the judicial protection of such rights. There is lack of explicit information on license of data use as well about their publication.

There is no central policy or regulation pertaining to re-use, nor pertaining to commercial re-use. Access to information law provides right to examine and copy, but does not mention re-use of such copies. Accordingly, no central policy or regulation on how to arrange ownership of data that is generated by third parties under government contract or procurement, which may leave the status of such data (government owned or privately owned) either undetermined or ad-hoc assigned within procurement by contracts.

VI. ACCESSIBILITY & TECHNICAL INFRASTRUCTURE

The critical success factors to meet the demands of users are data quality (completeness and actuality), distribution system and price for access and use of data. Distribution system should make data easily accessible, which will further enable the development of new services by the commercial market parties. Also, establishment of stable founding for data production and dissemination of key spatial data is an essential for unlocking data for wider use. Benefits of open data concept are recognized by main players in the national geo-sector. Awareness on free access to spatial data is arisen by introduction of potential of open data initiatives already applied in many European countries.

RGA is the leading institution in Serbia for provision of key geodata. The exchange and distribution of geo information is performed in accordance with access rights and specified fees defined by regulation. The regulation on fees for use of data of survey and cadastre and related services obtains the price list with condition for use. In some cases data and services are free of

charge for certain purposes such as: a report to governmental bodies for processes under their jurisdiction; extract from Real Estate Cadastre for processes initiated as an official task, development of spatial and urban planning and disaster risk management.

First steps for systematic utilization of geospatial data are taken by RGA in 2009 through lunching of the geoportal GeoSerbia [www.geosrbija.rs] with access to metadata and view of key data sets. The geoportal provides online public access to discovery and view services for spatial datasets and services from the competence of the Republic Geodetic Authority and other public authorities.

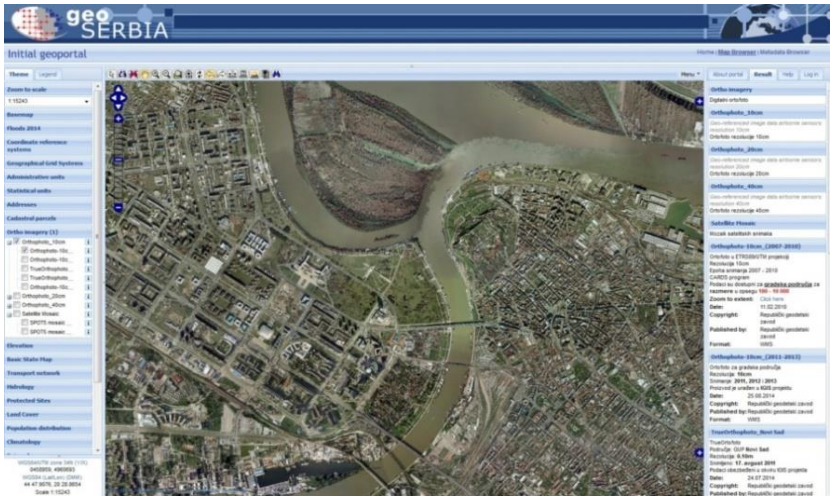

Figure 1: Map browser on the geoportal GeoSrbija

Spatial data and services are available on the geoportal "GeoSrbija" from official registers within the jurisdiction of RGA such as: coordinate reference system, geographical grid system, administrative and statistical units, addresses, cadastral parcels, orthophoto imagery, elevation, topographic and thematic maps. Based on cooperation with the public authorities, it is enabled access to geodata related to demography, land cover, pedology, hydrology, climatology, seismology, topographic maps, the road network, protected sites, as well as spatial and urban plans for particular areas.

Public authorities, local administration, educational and research institutions, private companies and other users daily use the geoportal for the purpose of performing regular work within its competence. In addition, citizens have easy access to geodata via the Internet. Currently, the geoportal is visited over 60 000 users per month. As result, over nine million hits on the Map Browser are reached monthly.

Metadata for the data sets are gathering using the Metadata Editor. Metadata are available for search and view on the geoportal via Metadata Browse page

[*www.geosrbija.rs/rga/rga_metadatabrowse*r].

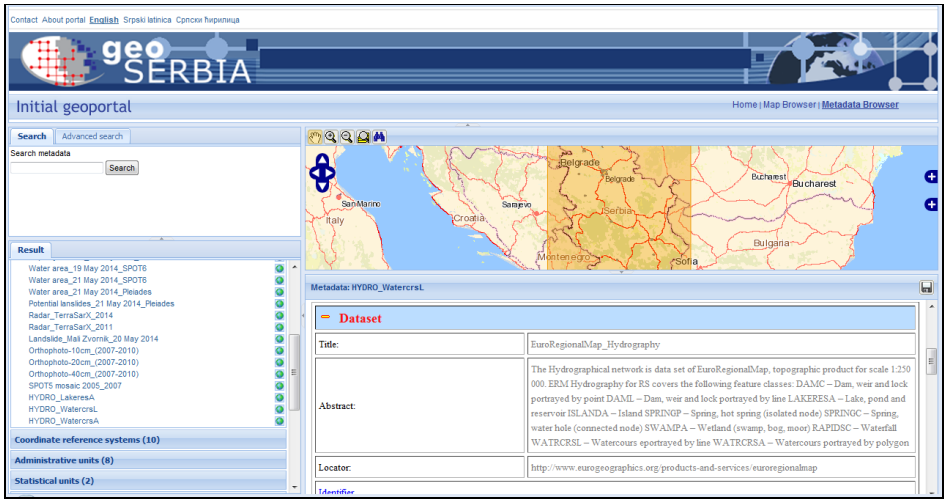

Figure 2: Metadata Browser Page

A metadata profile for NSDI purpose for data sets is based on the INSPIRE Implementation rules for metadata, ISO 19115 and ISO 19139. Metadata editor is an application developed for metadata acquisition and maintenance in line with the proposed metadata profile. It creates a valid xml files according to the ISO 19139 standard. Metadata are available for discovery and view via the initial geoportal on the Metadata Browser page. Metadata Catalogue Service for enabling proper repository for metadata as well as the central node for launching of discovery service is in the process (the final phase of development).

INSPIRE web portal was implemented during 2014 aiming to provide access to spatial data for internal RGA users and partner-public institutions .The portal is available at the address www.geoshare.rgz.gov.rs only for authenticated governmental institutions.

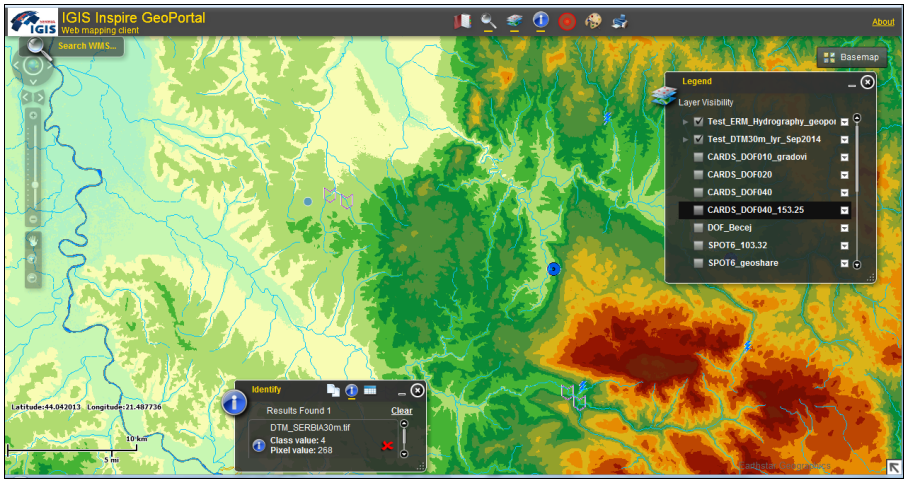

Figure 3**:** INSPIRE web portal

VII. SOCIO-ECONOMIC IMPACT

The Republic of Serbia, as a candidate for membership in the European Union has available funds under the IPA (Instrument for Pre-Accession Assistance). In addition, the Republic of Serbia actively participates in programs of cross-border and trans-national cooperation that are co-financed by EU funds. The cross-border programs involve achieving a balanced socio-economic development of the border areas through the establishment of strong links between the communities on both sides of the border, in order to increase the competitiveness of the economy and an increase of living standards in these areas. Evaluation of socio-economic impact of NSDI usage in Serbia was not done.

VIII. CAPACITY DEVELOPMENT

The problem with provision of adequate technical infrastructure and skilled staff with sufficient level of IT or GIS knowledge across government in Serbia is a significant obstacle. To effectively carry out its responsibilities, agencies need to have (or develop) clear business processes and stable resources for data production and management as well as staff with adequate ICT skills and technical understanding of data (e.g., formats, metadata, APIs, databases).

RGA had opportunity to develop and upgrade of its technical and human capacities in the past decade through many development projects where it has opportunity to cooperate with respectable institutions such as Statens Kartverk 2005-2011 (Digital Archive; NSDI Strategy; Initial national geoportal; Metadata profile + Metadata Editor), EU CARDS Program 2005-2010 (Orthophoto production on national level), JICA 2009-2011 (National Base Map Production) etc.

In the period from 2010-2015 RGA implemented Project of "Establishment of National Spatial Data Infrastructure (NSDI) and Remote Sensing Center for the Republic of Serbia" based on integrated geo information solution (IGIS) where significant capacities of national geo-sector where developed through application of the state of the art technology in data acquisition, processing and dissemination. Project was focused on two main components: data and services (internal and external). Within this project is implemented technical infrastructure that comprises flexible, fully scalable and interoperable components well suited for the needs of public authorities and business in Serbia. In doing so, and by using a comprehensive multi-source of data, it enabled a variety of spatial data to be produced such as: satellite and aerial imagery; orthophoto satellite mosaics for the national wide coverage; true-orthophoto and orthophoto; digital elevation models; highly accurate digital terrain model for the flood prone area based on LiDAR acquisition; 3D topographic data base; maps derived by application of remote sensing technologies for environmental, agricultural and risk management purposes etc.

The objective of the RGAs Real Estate Management Project (2015 – 2020) currently under implementation, focuses to improve the efficiency, transparency, accessibility and reliability of Serbian real property management systems. The project conducts through the four components:

- Component A: Valuation, Property Taxation and Public Real Estate Land Management
- Component B: E-governance for enabling access to real estate information

- Component C: Institutional Development of the RGA
- Component D: Project Management.

Although, capacities of RGA on all management and operational levels will be promoted through presented components of the project, specific focus within subcomponent B.2: Support to NSDI, will be given in development of capacities reflected through installed infrastructure and educated staff being able to implement and maintain new data, geoportal, INSPIRE network services and to harmonize data for themes under competence of RGA.

Besides the projects where RGA is main beneficiary, there are numerous national cross-sector projects where supply of geo information is a core component and where governmental institutions built their capacities through various aspects. On the regional level of the Western Balkan region implementation of the INSPIRE Directive is supported via projects:

- The multi-country INSPIRATION - Spatial Data Infrastructure in the Western Balkans project (2012 – 2013), financed by the European Union. The project aims at promoting spatial data infrastructure (SDI) and coordinating its implementation in the Western Balkans with a view to preparing beneficiaries to meet the objectives of the INSPIRE Directive;
- On-going the IMPULS project (2014-2018) financed by Swedish International Development Cooperation Agency (SIDA), supports the INSPIRE implementation in the Western Balkan region through settings of the grounds for technical interoperability and dissemination of spatial data and services between public authorities nationally as well as at the regional level.

Also, The Joint Research Centre (JRC) of the European Commission with the support of scientific partners of the Danube countries launched project 2013 to develop a Danube Reference Data and Services Infrastructure (DRDSI) that will facilitate access to comparable and harmonised data sets on various issues related to the Danube Region. Taking in consideration shortage of available metadata for spatial data sets and services in Serbia, the DRDSI project supports establishing of the local node for metadata and services dissemination. The metadata catalogue for unlocked data sets is developed via the pilot project with the Laboratory for development of the open source geospatial technologies (OSGL) at Faculty on Civil Engineering in Belgrade during 2016. Data sets created for research purpose through regular activities of the laboratory and other partners are stored on the common repository hosted by the laboratory. Services for view and download with appropriate metadata are created, where CSW service will be used for harvesting from the DRDSI technical platform as local node for open data in Serbia.

IX. USE OF NSDI

The current national capacities for establishment of NSDI are not sufficient within responsible public authorities. Especially, it is evident need for provision of sufficient and competent human resources considering complexity of the INSPIRE implementation in technical aspect. There are huge potential of the INSPIRE implementation for provision of harmonized geo information.

Considering fact that RGA is, by the nature of its work, the largest producer of key geographic data and consequently occupies the position of the main suppliers of geodata on the market, it is required that RGA has a leading role in monitoring trends in meeting the needs of modern society for quality and accessible information about the space.

The NSDI working groups prepared a questionnaire as a tool for gathering of information in order to consider status in the national geo-sector and needs for further development. A questionnaire is used for collection of information on existing spatial data sets, available capacities for their production and maintenance, the ways of cooperation among stakeholders, as well as current status of standards implementation. Surveys were conduct in 2012 and 2015. Based on the responses from national authorities and stakeholders, it is noted strong interest and support to the NSDI concept. Many barriers in utilization of data are identified such as: unpredictable financing, no digital data, no metadata, out-datedness of data, incompleteness, restriction for access to data, high prices, and redundancy in data production, geospatial stakeholders do not provide OGC web services for online access to data, lack of GIS capacity in public authorities, gap of information flow of available spatial data and services at the national geo market and alike. Taking in consideration the listed obstacles, recommended steps and actions will support development of NSDI to meet its potential such as:

- Strive for introduction of the appropriate financing policy for data providers from public authorities in order to open access to data;
- Promotion of the INSPIRE within the geodata community as integral part of NSDI establishment;
- Engagement of stakeholders be motivated to contribute by production of metadata and services on spatial data;
- Networking of available capacities to spread knowledge and benefits of SDI tools;
- Cross-border cooperation to meet interoperability, data harmonization and edge-matching as visible show case for a specific thematic domain.

Its important to be stressed that Republic Geodetic Authority is member of EuroGeographics, non-profit association and representative body of the European national cadastral, land registry and mapping authorities, since October 2004. Through successful participation in EuroGeographics projects implementation, the Republic Geodetic Authority shows that it is equal partner to other members in provision of quality and up-to-date geo information, giving national contribution to establishing European Spatial Data Infrastructure. The RGA participate in implementation of the European Location Framework (ELF) project. The overall objective of the Project is to define the rules for data licensing and to establish technical infrastructure for the national interoperable dataset in line with the INSPIRE requirements to be operatively available to the European-level users.

The recent development of web technologies has made a new revolution in acquiring a new source for providing geo information. VGI platforms provide valuable spatial data as a new potential source of acquisition of geo information. Volunteers' contributions to well-known collaborative mapping projects is already used and proven in practice. Many types of phenomena with associated geospatial aspect can be captured by integration of VGI data. Such a data can be complementary to data coming from public registries and can provide value-added information at low cost. For

example, this approach could be used to enrich disaster risk management models for relevant information inputs in case of need for rapid reaction.

There is no doubt that NSDI concept find its significant role in implementation of development projects especially on national level in the fields of spatial planning, environment protection, real estate management, agriculture, risk management etc., where usage of geodata is essential. RGA as a key institution in Serbia supports progress activities on national level through provision of data and services.

Having in mind lack of awareness on benefits of high level decision makers further development of NSDI in line with requirements of society oblige sound policy based on top-bottom approach, instead of heterogeneous and not well coordinate up to now.

X. DATA

RGA is key provider of cadastre, mapping and Earth Observation data in Serbia. Additionally, RGA, as the leading national public authority and contact point for the INSPIRE Directive implementation, has taken many initiates for cooperation and geodata and services sharing among public authorities. Besides, RGA is active member of numerous international organizations related to geodesy and mapping such as EUPOS and EuroGeographic.

Production cycle for some key data sets is defined by low for certain period (example: national coverage for orthophoto imagery in period less than five years) while some are updated constantly (cadastral data). Long term funding of data acquisition and processing is not in place for some data sets. So far some of the fundamental data sets are obtained mainly through the international projects (donors, EU funds, the World Bank loan and alike), while clear funding strategy is missing in the state budget allocation.

RGA distributes geodata and other information via traditional media (CD/DVD, external hard disks and alike) but also via web services (WMS, WFS or WCS) which is increasing rapidly in the past few years.

Core Data

Core or key reference data will be defined together with transposition of the INSPIRE directive into the Law on NSD classified through the themes. Further detailed definition of the institutions of the core data will be defined through the work of NSDi working groups and adopted though the NSDI Council.

RGA is institution which is currently responsible of the majority of the key data sets on the national level and for the activities related. It produces and maintenance following spatial data sets on national coverage:

- Digital orthophoto of 10 and 40 cm resolution, periodically updated;
- Digital terrain models of 1 to 25 m grid, periodically updated on national level;
- Digital cadastral plans with alphanumerical real-estate cadastral data base, constantly updated;

- Administrative boundaries with attribute data in Register of Spatial Units, updated per decision of local or national authorities;
- Address Registry data, constantly updated;
- Utility Cadastral data, in both raster and vector form, constantly updated;
- Geographical names in the Register of Geographical Names - Governmental Commission is appointed for standardization of geographical names where RGA takes leading role as chairman and for the data maintenance;
- Basic Topographic Model data base 1 : 20 000 scale consisting of themes Buildings, Hydrography, Transport Network, Land Cover, Relief and Utilities and linking feature classes, produced for the 12% of the territory of state;
- National Base Map 1: 5 000 scale, produced for the urban areas in raster and vector form;
- Satellite imagery (RGBI, multispectral) from 2.5 to 0.4 resolutions.

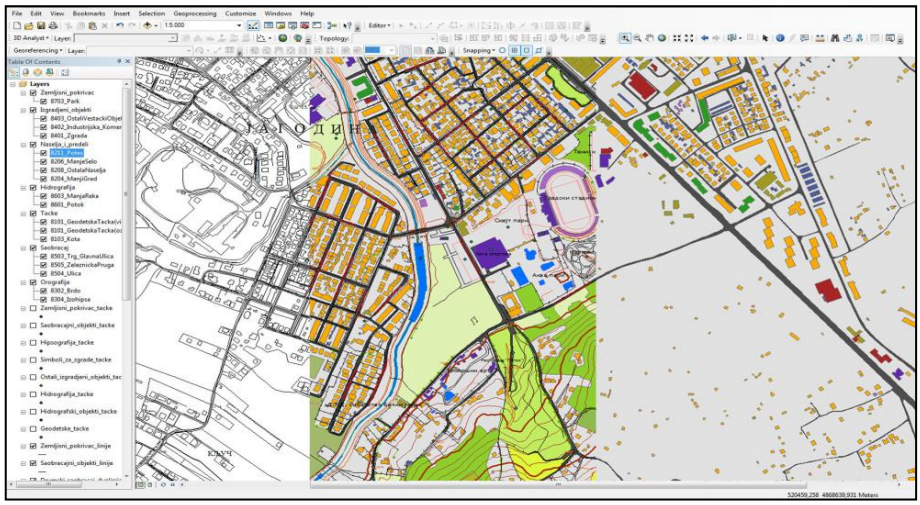

Figure 4**:** National Base Map

Thematic data

Beside key data sets RGA produces also the specific spatial data with thematic purposes such as thematic (geographic, historic, heritage, national park and other maps), agro-environmental and hazard maps.

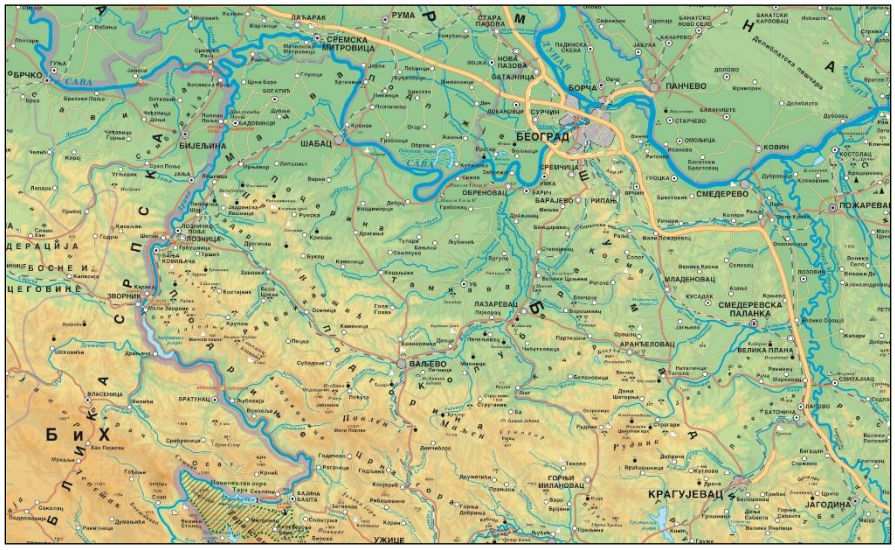

Figure 4: Geographic Map-part of Serbia (scale 1:300 000)

The RGA capacity is developed for production of agro-environmental maps by using most advanced technology in the field of remote sensing. Generic Land Cover map of Serbia on national level is produced and it consists of 10 classes: artificial areas, bare soil, cropland, grassland, shrubland, deciduous forest, mixed forest, coniferous forest, wetlands and water. Completed map will covers 88 444 km2 and its the most detailed homogenous Land Cover map of Serbia in sense of minimal mapping unit (4 pixels) with general accuracy of 86.16 % and in line with INSPIRE Technical Specification for LC.

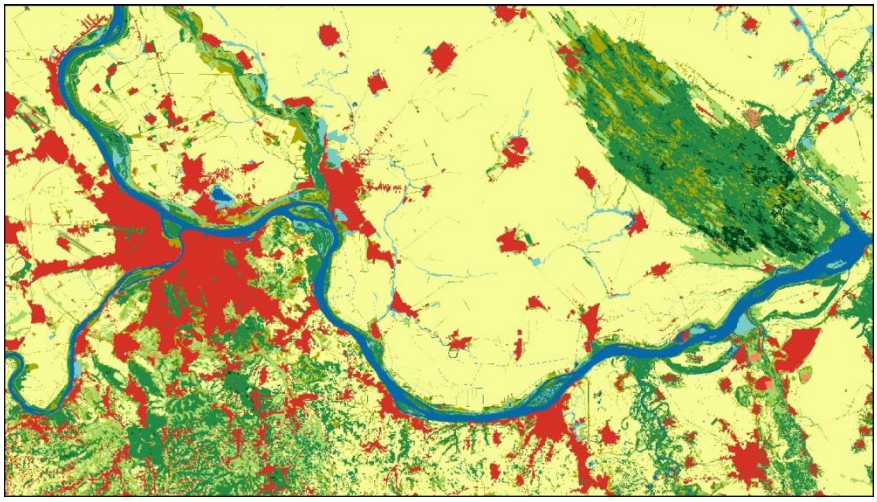

Figure 5: Generic Land Cover Map

Also, RGA has capacities to produce Agriculture Land Cover Maps, Maps of Biophysical Parameters, Natural Habitat Maps and Draught, Flood AND Potential Landslide Maps. During flood in 2014, RGA performed application of semi-automatic classification of the water, land saturated with water and landslides thus giving information on around 7 000 km2 on volume of

endangered areas and intensity of the disasters, thereby helping the damage assessment and supporting the creation of final decisions during the remediation of damage caused by the floods. It is interested to be mentioned that 759 landslides was detected.

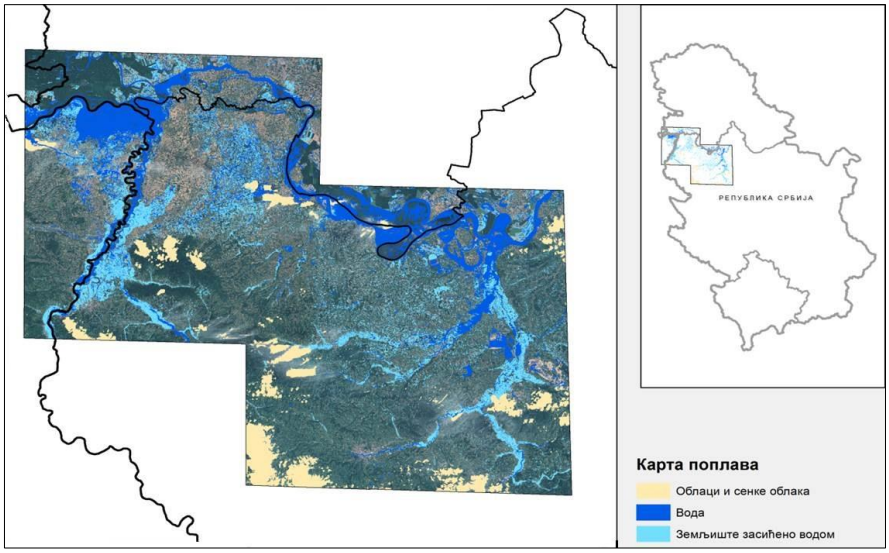

Figure 6. Flood Maps – West Serbia

XI. ROADMAP FOR THE USE OF GEOSPATIAL DATA AND SERVICES

The Republic Geodetic Authority adopted the RGA Strategy 2020 aimed to meet the requirement of the Government of the Republic of Serbia pertaining to the land administration improvement, with the support of the World Bank and other partners. The strategic objectives are to be met by the end of 2020. Strategic objectives lay a foundation for definition of the roadmap for the use of geospatial data and services in future. RGA aims to support managing an effective national development and enhancement of operation policy in all national institutions of the Republic of Serbia. Overall objective is to improve the nationwide quality of living through:

- Increasing the economic productivity of the country;
- Preservation of environment and natural resources;
- Improving agricultural industry and rural development;
- Promoting private entrepreneurship;
- Protection of citizens' life and health and their properties against natural disasters and other hazards, with strong response and recovery capacities.

Taking one step further, RGA decided to undertake all necessary steps to ensure and utilize a full potential of geospatial data in managing an effective policy of development and operation in the public institutions of the Republic of Serbia through provision of its the support. RGA take initiative to establish the Regional Center of Excellence for Geospatial Information Management which should contribute to the evolution of geo-sector in Serbia promoting in that way all

community activities relying on the spatial data in its efforts to succeed sustainable social and economic development. Such Center would also accelerate the European integrations of the entire region, improve the cooperation between the institutions and the countries and enable the region to keep up with technological innovations and experiences world-wide.

The basic function of the Center would be to develop, find and share the most optimal solutions for the geospatial data management within the spatial data infrastructure through innovation, developing methodologies and training. It will focus on:

- Geospatial data availability and use;
- Data users education;
- Implementation of modern technological solutions in the field of geospatial information;
- Development of methodologies and procedures in geospatial data application and analysis;
- Savings in geospatial data acquisition and processing;
- Improvement of geospatial data quality and introduction of standards;
- Decreasing administrative costs;
- Efficient provision of data and services, without redundant activities;
- Constant improvement of the RGA's operation and services focusing on application, challenges, solutions and results;
- Improving national legislation and internal regulations;
- Establishing a better business environment for private and public sector and the citizens;
- Establishing and improving inter-institutional cooperation at national and regional level;
- Promoting Euro-integrations;
- Acting as contact point for cooperation with the international institutions.

Drafting the Roadmap of the Regional Center of Excellence for Geospatial Information Management Establishment 2017-2020, comprises the activities focused on:

- Development of the strategic approach in geospatial data use nationally;
- Establishment of the center through the phases: geo-sector analysis, raising awareness on the importance of the geospatial information use on management and operational level and definition of geospatial data management concept, legal framework adaptation, operational establishment and building of capacities
- Know-how and education of stakeholders;
- Development of applications and services;
- Implementation on geospatial data in business processes;
- Continuous development, research and innovation with the aim of implementing usage of multiply sensors data of the latest technology, remote sensing methods, advanced web technologies, crowdsourcing models for data and service provision, data mining methods for geo information gathering, machine learning analytical methods and other.

XII. GOOD PRACTICES FROM SERBIA FOR THE USE OF GEOSPATIAL DATA AND SERVICES

After implementation of initial geoportal GeoSerbia it is widely used by many professional users, as well by citizens, to search and view data under their interest such as: property, addresses, roads, orthophoto and satellite imagery, topographic maps and alike.

Urgent satellite imagery was acquired for the areas affected by the devastated flood in May 2014 for the western part of Serbia. The supplied imagery is analyzed by using remote sensing methodology for obtaining the information on flooded areas, soil saturated by water and potential landslides. Ministries and other public authorities used the imagery with additional mapping data within emergency management to assess the impact and the extent of damages caused by floods. Additionally, Republic Geodetic Authority cooperated with private sector to provide geo information acquired by unmanned aerial vehicles for the most affected sites by floods and landslides. The obtained spatial data on the flooded areas are used for assessment of disaster effects – damages and losses – and impacts as well as the financial requirements to undertake recovery and reconstruction. Satellite data obtained and results of remote sensing detection can be found on geoportal *www.geosrbija.rs* in the theme Floods2014.

Figure 7. Flooded area – City of Obrenovac

One of the very important activities realized after floods in 2014 was implementation of the Project "Harmonization of data on landslides and training local governments to monitor them - BEWARE" for the purpose of building capacity and establishing the methodology for production and preparation of landslide hazard maps and the risk of landslides. The project is financed from EU funds and the government of Japan and the institution responsible for the implementation is the Ministry of Mining and Energy. RGA fully supported activities in the pilot areas (the 27 municipalities in Republic of Serbia) through the provision of data of digital terrain models, forest cover data and satellite images and transferring the knowledge. The Project is successfully finished and results can be reached on the site *http://geoliss.mre.gov.rs/beware/*.

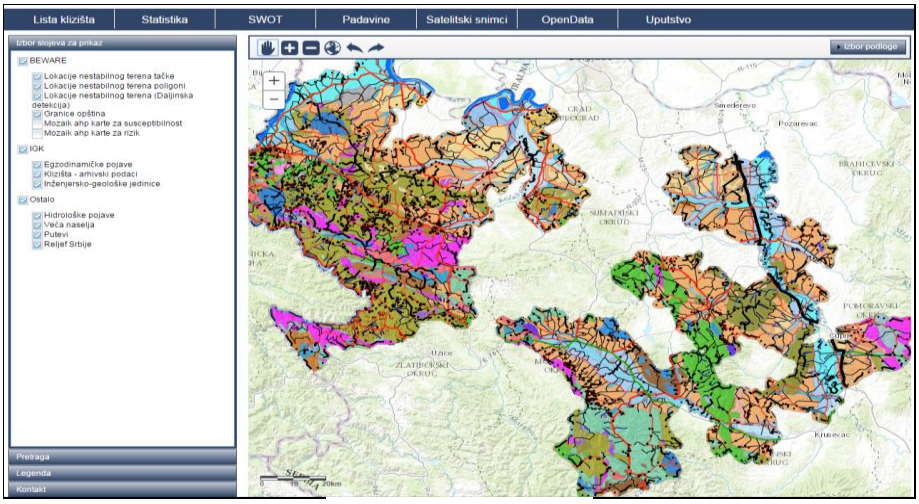

Figure 8. BEWARE

For the realization of the activities of implementation of LPIS in Serbia (Land Parcel Identification System) as a key component of the Integrated Management and Control System (IACS) in order to implement the Common Agricultural Policy of the EU, Government adopted Action Plan that envisages the creation of legal basis for achieving functional and sustainable system of cooperation between the Republic Geodetic Authority and Ministry of Agriculture and Environment Protection -Directorate for Agrarian Payments, although two institutions already signed the cooperation agreement, because RGA is recognized as an institution that will participate in establishing of the initial LPIS system and its maintaining through the provision of knowledge and experience and essential geospatial data at the national level. Data relevant to the establishment of the system are: digital orthophoto, land cover data, topographic maps, digital terrain model, the data of real estate cadaster and of the Register of spatial units.

IPA II Action Document 2014 supports flood recovery and prevention foresees development of flood risk and hazards maps for flood prone areas as well as upgrade of the water information system. Since RGA already developed capacities in production of highly accurate digital elevation model necessary for generation of above mentioned maps, it participates in the Project "Flood risk maps developed for sub-basins and flood protection improved". The aim of the project is to build national capacities for the management of flood risks to which the various institutions cooperate and work together to reduce risk and more effective response to disasters. The project is financed from the EU pre-accession funds (IPA II Sector: Environment) and donations. Besides RGA, the institutions responsible for the implementation are the Ministry of Agriculture and Environmental Protection-National Water Directorate, Government of the Republic of Serbia - Office for public investments, Republic Hydro-meteorological Service, Military Geographic Institute and public water management companies. RGA will work on the creation of digital terrain models of high accuracy obtained on the basis of data collected LiDAR technology for 75 priority river catchments areas.

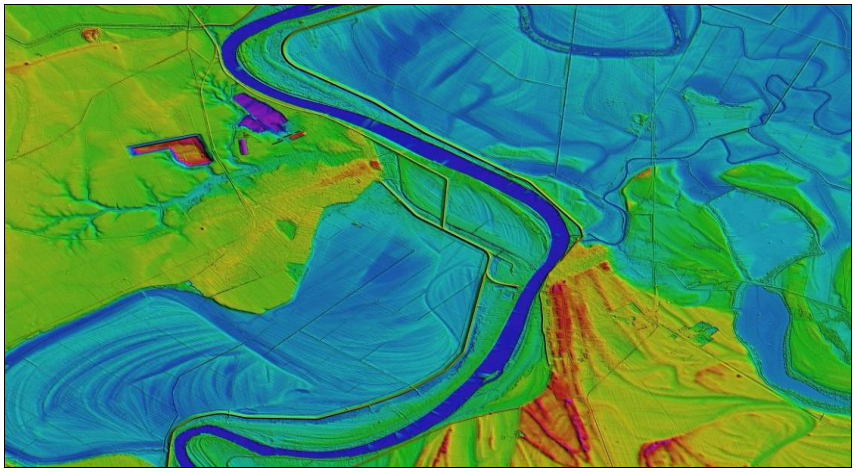

Figure 9: DTM for Flood prone area of Tisa River based on LiDAR

Activities on the implementation of Project "NATURA 2000" activities - establishment and development of the ecological network and habitats as well as biodiversity conservation measures, started in 2016 in Serbia. RS is obliged to perform the pre-accession period transposition of the Birds Directive 2009/147 / EU and the Habitats Directive 92/43 / EEC as one of the preconditions for EU accession. The project is financed from the EU pre-accession funds (IPA II- Sector: Environment). Again, in relation to the RGA developed capacities in data production and dissemination, RGA is recognized through Govermental Action Plan as institution that will support the implementation and the maintenance of the national ecological network and NATURA2000 habitats by providing the necessary geospatial data at the national level and its experience. Ministry of Environment-Department for Environment and Nature Protection Institute of Serbia and RGA signed cooperation agreement. For the purpose of the NATURA2000 activities RGA provided: digital orthophotos, digital terrain models, land cover data, the data of agricultural land cover maps, natural habitat maps, satellite mosaic, topographic maps will transfer the knowledge in mapping related to environmental protection gained in the implementation of development project IGIS.

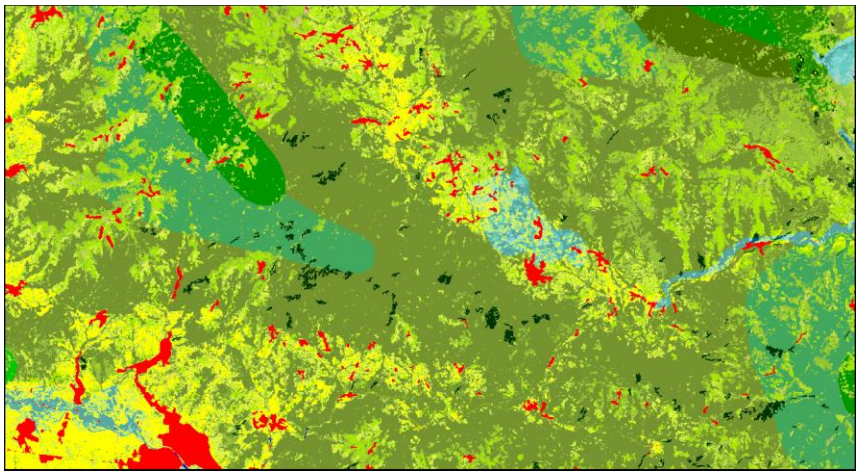

Figure 10: Natural Habitat Map

XIII. FUTURE CHALLENGES

Different Government institutions are generating inordinate amounts of data, but these are not used to inform policy making (and in some cases even lost irrevocably) because the institutions involved lack capacity and manpower to properly process and link them between subsectors and over time. This leads to undesirable outcomes in several respects, namely (i) policy-makers do not have the information needed to inform policy choices and assess the trade-offs involved; (ii) the public debate on critical policy issues is based on ideology and stereotypes rather than a more nuanced assessment of the actual situation, generating uncertainty; (iii) private sector decision-making is impaired in the short (information gaps) and the longer term (lack of people with the necessary managerial skills and research capacity.

Capacity development to make best use of available data and services for making more informed decisions where and when needed is a big task ahead.

Coordination and cooperation among all key players at all levels remains the biggest challenge in the years to come.

Crucially, the security and privacy of personal data need to be considered and must be guaranteed.

Introducing motivation mechanisms to encourage innovations, research and development is a key driver.

Further efforts will be needed to strengthen the collaboration with the private sector. Close collaboration of all the parties involved – public sector, private sector, academia and relevant professions – is a key factor in bringing products and services successfully to the consumers.

Countries need to develop engagement strategies and look for a high level political support, demonstrating the social and economic benefits of investments to be made.

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